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Marketing Margins of Strawberries 2006-2010 Shipping Point-Terminal-Retail Price

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MARKETING MARGINS OF STRAWBERRIES 2006-2010 SHIPPING POINT – TERMINAL – RETAIL PRICE

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By

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ABSTRACT

This thesis examines vertical price relationships for fresh strawberries. Specifically, the focus is on three stages of the vertical chain. The first stage is the shipping point. Shipping points represent major strawberry production regions and are the closest price point to the farm. The second stage is the terminal market. Terminal markets are wholesale markets in major US cities. The third stage is the retail level. Retail level prices are measured as average supermarket prices in the same cities for which terminal market prices are available. Using weekly data, markup equations are estimated from upstream to downstream levels of the market. Findings indicate that strawberry prices at one level of the market were very responsive to the price at the next level downstream in the marketing channel. A measure of total weekly supply and controls for seasonality were also highly significant in the pricing model. Increases in shipping costs depressed shipping point prices and raised terminal market prices. This means that a portion of the increase in shipping costs is passed back towards the farm level in the form of lower prices and a portion is passed forward to the consumer in the form of higher prices at the retail level. Measures of market structure also impacted strawberry prices but not necessarily in the expected fashion. Retail concentration among brands (typically the labels of major shippers) caused small increases in price at both the shipping point and terminal market levels. Prices in both shipping point and terminal markets were lower when one specific supply region dominated the market.

Key words: marketing margin, markup price, terminal market, shipping point, retail price

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CHAPTER 1

INTRODUCTION

1.1 Price Relationships within the Vertical Chain for Strawberries

The focus of this thesis is on prices for fresh market strawberries at different stages of the vertical chain. As shown if figure 1.1, the market for fresh strawberries has increased substantially over the last four decades. In the United States, strawberries represent an important specialty crop that is sourced primarily from domestic farms, mostly in California. As other regions of the country seek to diversify their agricultural production bases, specialty crops such as strawberries, have been viewed as one means by which this can be accomplished.

The thesis examines the linkages between prices at three levels of the vertical chain for fresh strawberries. The first stage is the shipping point. Shipping points represent major strawberry production regions. The second stage is at terminal markets. These are wholesale markets in major US cities. The final stage is retail supermarkets. The retail prices used here reflect aggregate (average) supermarket prices in major US cities. The aims of the thesis are to provide a better understanding of price transmission between these three stages of the market, the impact of the cost of marketing inputs, and the role of seasonality. In terms of marketing costs, my primary interest is in the role of shipping costs. Over the past few years, shipping costs have been very volatile (see figure 1.2), and it is important to understand how these are affecting prices at different stages of the vertical chain.

1.2 Food Marketing

The food marketing system involves numerous participants (Kohl and Uhl, 2002). The chain in food marketing starts at the farm level. When produce leaves the farm it can be consumed directly by households, but normally it proceeds through other steps of the marketing process. After leaving the farm, foods generally require sorting, assembly, packaging, and transportation to reach the final consumer and many require substantial processing steps. The food marketing system also involves outside players who import goods into the country. Various market intermediaries such as food brokers and warehouses are involved. According to Kohls and Uhl, (2002, p. 7) marketing can be defined as:

> The performance of all business activities involved in the flow of food products and services from the point of initial agricultural - production until they are in the hands of consumers.

Marketing can also be defined in terms of the value or utility it provides. Initially marketing first meant "that combination of factors which had to be taken into consideration prior to the undertaking of certain selling or promotional activities."(Bartels, 1976, p.72). Bartels (1976) explains that marketing is fundamentally finding satisfaction for people and that a latent presumption in the practice of marketing has been that marketing gives to society more than society gives to it. This is reflected in the definition of marketing provided by the American marketing association (AMA, 2011):

> Marketing is the activity, set of institutions, and processes for creating, communicating, delivering, and exchanging offerings that have value for customers, clients, partners, and society at large.

1.3 Marketing as a Value Added Process

Kohls and Uhl (2002), note that when products leave the farm, marketing activities provide utility in several ways. One way, form utility, involves changing the form of the product into something more desirable to consumers. Secondly, many crops are seasonal and so marketing decisions can affect time utility. Time utility refers to value that is created by providing a product to the consumer at the time he or she desires it. In agriculture, time utility is added by storing crops into non-harvest months, or in the case of perishable crops, producing varieties with different harvest windows and sourcing products from regions with different growing seasons. Place utility refers to value that is added by providing products in a location that is convenient to consumers. Transportation from growing regions to metropolitan areas adds place utility. Finally, various market intermediaries add value by providing support roles. Financiers, insurers, information providers, and numerous others help facilitate the transfer of products from one actor to another through the vertical chain. These types of activities add possession utility.

A marketing channel can be described as a conduit through which ownership, communication, economic value, or risk flow towards to the consumer (Beckman and Davidson, 1962). More commonly, a marketing channel is described as an economic structure of independent players (producers, market intermediaries, organizations, and

cooperatives) that perform the steps necessary to move final products to customers (Armstrong, 2003). Marketing channels may be of various lengths and complexity depending on the marketed good. (Kohl and Uhl, 2002).

1.4 Marketing Margins

Analysis of marketing margins is performed using econometric analysis and has been very important to understanding price transmission for many commodities (Brorsen, Chavas and Warren, 1987; Brorsen, Chavas and Grant, 1985). Statistics maintained by the United States Department of Agriculture (USDA), Economic Research Service (USDA-ERS, 2008) compare prices that are paid by customers for food with the price that are received by farmers for their commodities. USDA-ERS reports statistics for various types of commodities and commodity baskets. For example, within the dairy basket the farm share of butter was $0.35 out of every dollar, for ice cream the share was $0.15, and for the whole milk the share was almost $0.50. For fresh fruits and vegetables, farm shares fluctuated from $0.31 down to $0.28.

1.5 Previous Work on Marketing Margins

Retail-farm margins are of primary interest to agricultural economists for numerous reasons. Foremost, wider margins mean that growers obtain a smaller share of the retail dollar. Throughout periods when retailers are not able to raise their prices, lower margins translate into lower grower revenue. Another very important concern is the extent to which margin growth cannot be explained by marketing costs as this may suggest inefficiencies somewhere in the marketing channel (Kinnucan, Nelson and Hiariey, 1993). Key papers on price transmission include Gardner (1975), Heien (1980),

and Wohlgenant and Mullen (1987). Wohlgenant and Michael (2001) provide a review and explanation of approaches to analyzing marketing margins.

Inefficiencies in the marketing channel are often attributed to the exercise of market power on either the buying or selling side of the market. Disproportionate flow of information is often found as one of the reasons for slow margin alteration in response to changes in underlying conditions (Richards, Acharya and Molina, 2009). Speed of price transmission has also been of interest in the literature. While retail prices react promptly to price increases, it is likely that farm prices often take time to adjust. In studies involving long sample periods, the potential for technological change and its impact on margins has been another issue in assessing the efficiency of the marketing system (Brester, Marsh and Atwood, 2006).

Also of interest is whether margins are affected by the degree of uncertainty in returns to a crop if risk arises through prices or yields (Brorsen, 1985). The main problem that particularly concerns growers of the fresh fruit is that they do not have access to future markets or additional crop insurance. Very few of these issues are explored in fruit markets (Richards, Acharya and Molina 2009).

1.6 Measuring Marketing Margins for Strawberries

In this thesis I will analyze margins for fresh market strawberries, and as noted above I will be examining three levels of the vertical chain, the aforementioned shipping point, terminal (wholesale market) and retail markets. Shipping point prices are not prices received by farmers but do reflect the price point that is closest to the farm level. As shown in figure 1.3 (page 11), strawberries can be transported from shipping points to terminal markets and then on to retail outlets. Alternatively they could move from shipping points directly to retailers, bypassing the terminal market. Consequently I examine three marketing margins in this thesis:

(1) Shipping Point to Terminal Market

(2) Terminal Market to Retail Market

(3) Shipping Point to Retail Market

The approach followed in this thesis is based on pioneering work of George and King (1971). They specify a mark-up pricing model as follows:

(1.1) $M = \alpha + \beta P_r + \varepsilon$

Where: *M* is the mark up defined as the retail prices (P_r) minus the farm price (P_f), a and b are coefficients and e is an error term. Marsh (1996) modifies this model to include controls for seasonality.

1.7 Characteristics of the Marketing Channel for Strawberries

Mohaparta et al. (2009) provide a comprehensive overview of the marketing channels for fresh strawberries. According to them, most growers pay a fee to strawberry shippers. Shippers also import strawberries, as do other importing organizations. Shippers or importers provide strawberries directly to retailers or offer strawberries for sale through terminal markets. Market intermediaries such as vendors and brokers usually use terminal markets but do also buy directly from shippers and importers. Shippers are concentrated on one or two of five growing regions: three of these are in California (South Coast, Santa Maria, and Watsonville). Florida and Mexico comprise the other two regions. Every region has its own fixed harvest season and none of these regions provide strawberries all year.

Mohaparta et al. (2009) also explain how retailer strategies influence the strawberry market. One cost control strategy is to rely on a smaller number of larger suppliers in an effort to reduce transactions costs. This has led to contractual arrangements involving pre-obligation of berries. Since strawberries are highly perishable, shippers handling large quantities of strawberries must place these berries in a short time, and often are able to do so only by lowering prices. When volume is pre-obligated, shippers do not need to engage in as much last-minute price-cutting. Such practices are most common in the spring during peak strawberry season and when retailers are heavily promoting strawberries. In the summer, there is less retailer interest in supporting strawberries as the profits from doing so are low relative to the income from promoting alternative substitute fruits.

1.8 Organization of this Thesis

Chapter 2 describes my dataset on different levels of the strawberry market and explains the sources of the data and the measurement issues involved in compiling my dataset for analysis. In this chapter, I outline the major origination points for strawberries and delineate the terminal/retail market cities that are examined in my study. Chapter 2 also provides additional details on the empirical model that I pursue. My results are presented in Chapter 3. In this chapter I first point out key characteristics of fresh strawberry prices and margins over time, this is then followed by a discussion of the results and implications of my estimated shipping point to terminal, shipping point to retail, and terminal market to retail market models. Chapter 4 concludes by summarizing the main findings of the thesis.

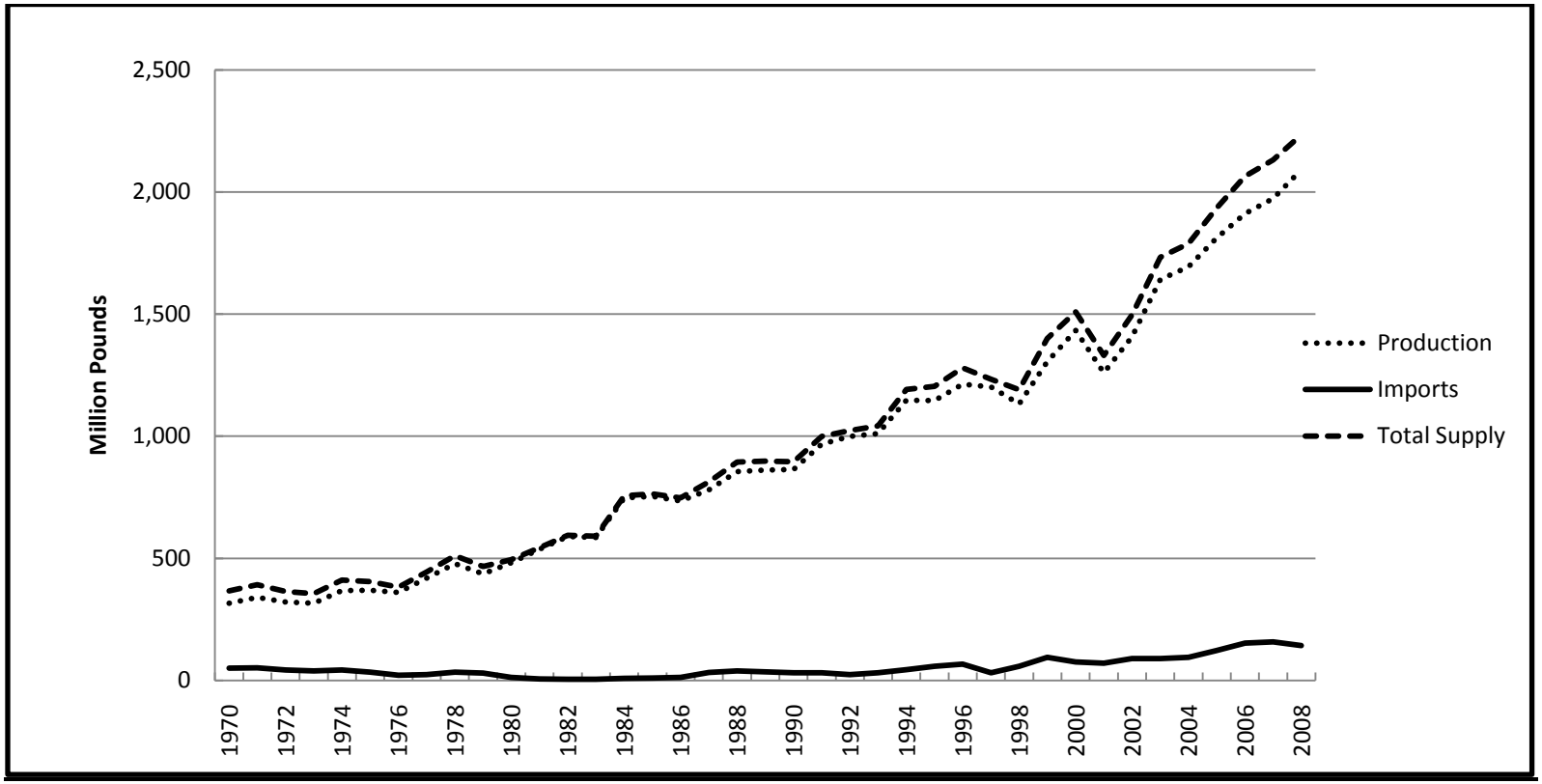

Figure 1.1: Total supply, imports and production of strawberries in the U.S. 1970-2008(in million pounds) Source:(USDA, 2009)

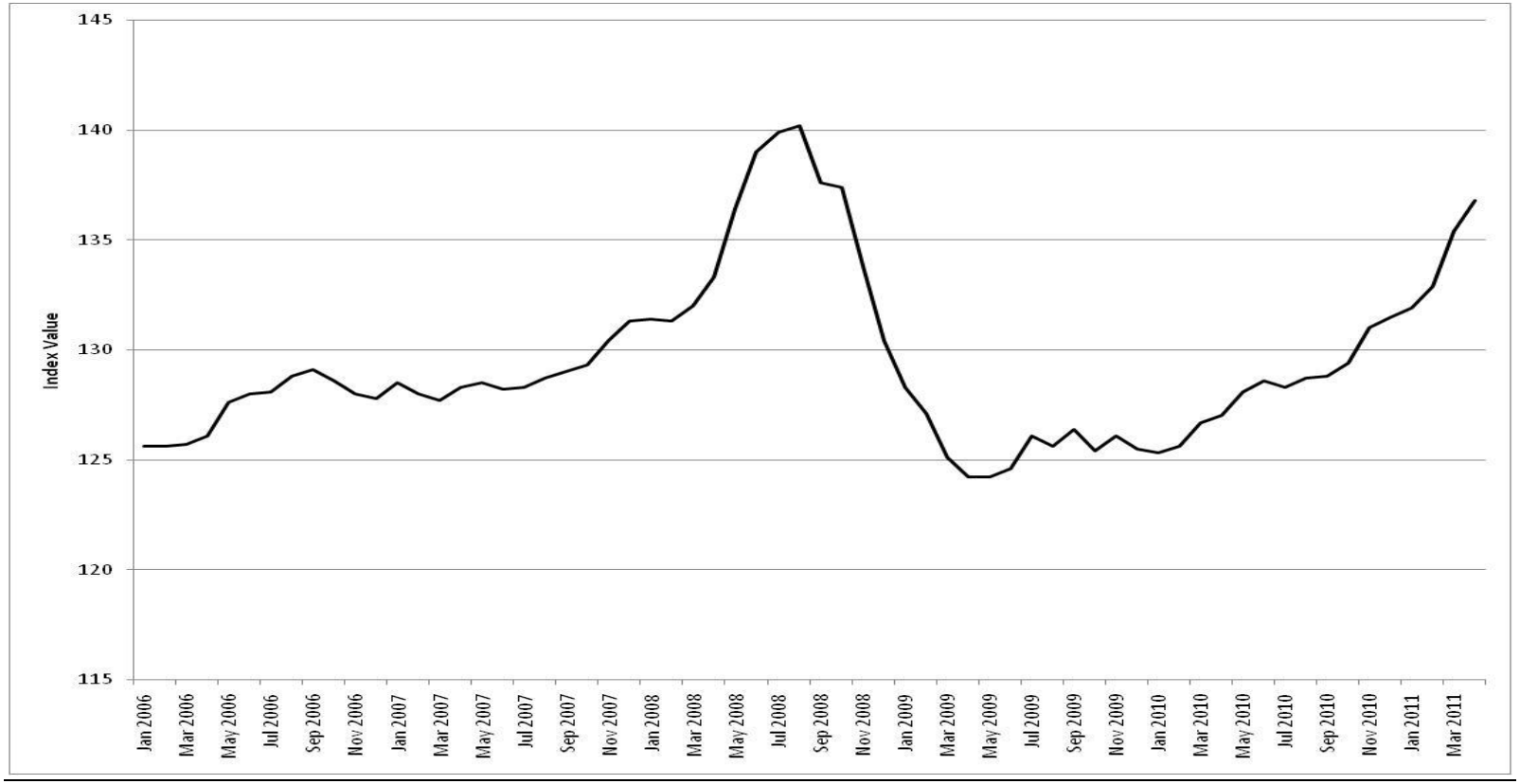

Figure 1.2: Producer price index for long-distance general freight trucking (1982-1984 = 100)

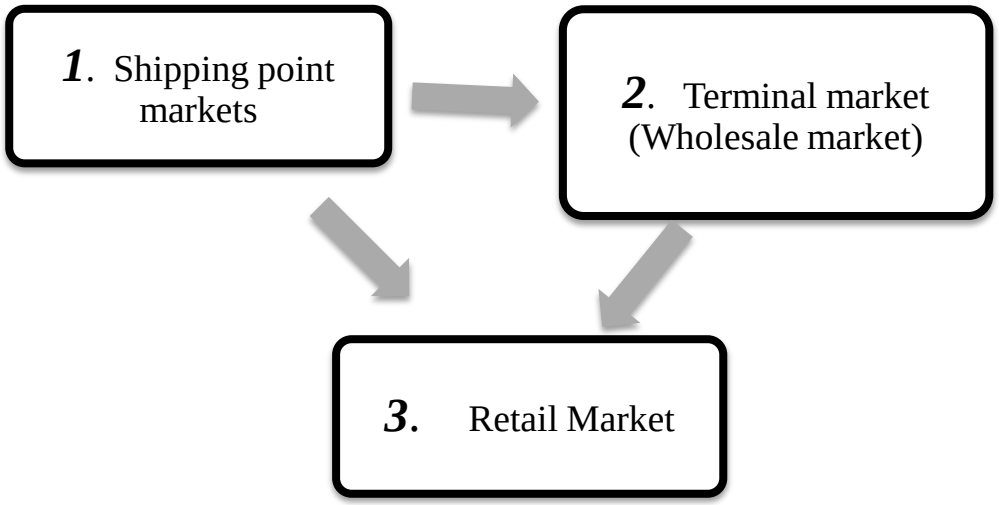

Figure 1.3: Points in the marketing channel for fresh strawberries addressed in this thesis

CHAPTER 2

DATA & METHODS

2.1 Data Sources

Prices at shipping points were obtained from the USDA Agricultural Marketing Service (AMS) historical market news data. Major shipping points for strawberries reported in the AMS data and used in this study include the following:

1. Oxnard, California
2. Orange and San Diego Counties, California
3. Southern District, California
4. Salinas-Watsonville, California
5. Santa Maria, California
6. Crossings through Otay-Mesa, Mexico
7. Crossings through Texas, Mexico
8. Central Florida
9. Eastern North Carolina

Prices at terminal markets were similarly obtained from USDA-AMS historical market news data. I selected 10 terminal markets for inclusion in this study. My rationale for including these 10 terminal markets was based on the availability of truck rate data for strawberry shipments between many of the shipping points and these terminal markets. As described below, the AMS truck rate data proved to be inadequate

for my purposes in this thesis. However, I continued to include these markets in my analysis as they represent a good diversity of shipping distances from shipping point regions. Moreover, the fact that AMS reports truck rate data to these cities is probably indicative that they are high volume markets. These terminal markets are:

1. Atlanta
2. Baltimore
3. Boston
4. Chicago
5. Dallas
6. Los Angeles
7. Miami
8. New York
9. Philadelphia
10. Seattle

Prices at the shipping points and terminal markets are reported by how the fruit was packaged for shipment. The most commonly reported package size in the AMS data was for flats consisting of eight one-pound containers with lids. Consequently, I am using prices for these flats as my measure of strawberry prices. One data problem is that prices reported in terminal markets and shipping points are not attached to volumes and moreover, it is not possible to link the physical flow of product volume from a shipping point location to a terminal market location. I only observe a price at the shipping point and a price at the terminal market. The potential pitfalls in averaging across package sizes without the ability to properly account for weights is one reason for using a single,

high frequency package size as the price indicator in my study. I deleted price quotes for organic strawberries and then averaged over quotes for different berry size characteristics, provided each quote was for a flat of eight one-pound containers with lids. The AMS data provide a low price and a high price estimate for both shipping point and terminal markets. I took the simple arithmetic average of the low and high price quotes before averaging over berry sizes.

Retail level prices were purchased from Nielsen Company. The retail-level data do contain volume as well as price data. However, to maintain consistency with the shipping point and terminal market prices, I used only non-organic 16 ounce (one pound) containers as the retail price indicator. The retail data are reported by brand name (usually the label of a major strawberry shipping company) and so I used volumes by brand to obtain a weighted average retail price. To facilitate comparison with the shipping point and terminal market prices, I multiplied this value by 8 to convert the retail price to a per-flat equivalent. Retail prices were measured for each of the 10 cities in which terminal market prices were used.

The price data used in this study cover the period from 2006 through early 2011 and are measured weekly. Retail level prices were only available at quad-week intervals beginning February 23, 2008 and were available weekly thereafter.

I gathered data on volume movements reported by USDA-AMS for use in my thesis. These volumes are reported in 10,000 pound intervals and do indicate the origin of the berries. However, as noted above they are not tied specifically to given set of package characteristics and so cannot be used in weighting shipping point prices over

different package attributes. However, these volumes do show the relative importance of each shipping point region to the overall strawberry market. Figure 2.1 (page 20) shows that central California origins (Salinas-Watsonville and Santa Maria) account for well over half of all shipments reported to the USDA market news. This is followed by Southern California Districts (Southern California, Oxnard and Orange and San Diego Counties). Production from other states (Florida and North Carolina) along with imports from Mexico accounted for much smaller shares of the overall market. Additional details of these volume data are reported in the next chapter to show seasonality in the supply of fresh strawberries.

To measure shipping costs, I used the US Bureau of Labor Statistics, producer price index long-distance general freight trucking (series PCU4841214841212) as a proxy for freight rates. I also computed mileages between each shipping point location and each terminal/retail market city (see table 2.1, page 19). My measure of shipping costs was computed as the product of the producer price index and this mileage measure. I did gather actual shipping costs between shipping point locations and terminal markets reported by USDA. However, these data were problematic in that they did not provide consistent information on some of the lower volume shipping point regions, especially North Carolina, and were otherwise incomplete. Consequently, shipping costs are measured using the producer price index and mileage as described here.

2.2 Empirical Model

Because my study involves high periodicity data covering only a few recent years, the assumptions of fixed proportions technology is quite reasonable. For this reason, I use the basic model provided by George & King (1971) to estimate the marketing margin. As outlined in the previous chapter, their model specifies the margin as:

(2.1) $M_{AB} = \alpha + \beta P_B$

where $M_{AB} = P_B - P_A$ is the mark-up from upstream level A of the marketing channel to downstream level B. The parameters of 2.1 are estimated by substituting the definition of M_{AB} into 2.1 and then solving for P_A to get:

(2.2) $P_A = a + b P_B$

where $a = -\alpha$ and $\beta = (1-\beta)$. In estimating 2.2, I control for seasonality, marketing costs, and measures of market structure. Thus the model I estimate can be specified as:

(2.3) $P_A = a + b P_B + \sum_{w=1}^{51} \delta_w D_W + \sum_{k=1}^{M} \gamma_k X_k + \varepsilon$

Where the D_w are binary variables indicating the week of the year, the X_k are controls for marketing costs and market structure, and ε is an error term.

2.3 Controls for Marketing Costs and Market Structure

Marketing costs reflect the costs of taking the product from one stage of the vertical chain to another. In this thesis, my measure of marketing costs is shipping costs. As described

above this is based on the mileages between shipping points and terminal/retail market cities and the producer price index for long distance general freight trucking.

Several controls are used for market structure. The Herfindahl-Hirschman Index (HHI) is an accepted measure of the market concentration and is defined as:

(2.4) $HHI = \sum_{i=1}^{N} S_i^2$

where S_i is the market share of the i^{th} seller and N is the total number of sellers. HHI is bounded between zero and one. The measure increase as a number of sellers decreases and disparity in size between firms increases. In my study, I use this measure in two ways. First, as a measure of retail concentration, I compute this measure by using the dollar shares of each strawberry brand in a given retail market (brands normally correspond to shipping companies). Note that this is not retail concentration in the normal sense of whether the market is dominated by one or two retail chain stores. Rather this measure reflects how many different shippers were supplying the retail market. Second, I use HHI computed over the volume shares originating from the nine shipping point regions described above. Again, this not a measure of market power *per se*. Rather it reflects the extent to which one region dominates the supply side of the market. In addition to HHI, I include the share of the district in question and total volume from all shipping point regions as additional controls for the structure of market supply.

2.4 Price Flexibility Computation

The left-hand-side of equation 2.3 will be either the shipping point price (in case of analysis of shipping point to terminal and shipping point to retail margins) or the terminal

market price (in the analysis of terminal market to retail margins). Consequently, I can use the estimated coefficients to obtain price flexibilities. Mathematically, these price flexibilities are defined and computed as

$$\phi_{A,Z} = \frac{\%\Delta P_A}{\%\Delta Z} = \theta \frac{\bar{P}_A}{\bar{Z}} \tag{2.5}$$

Where θ is a regression coefficient corresponding to any continuous explanatory variable Z in the equation 2.5 above.

Table 2.1: Mileages between shipping point locations and terminal/retail market cities

Shipping point	*Atlanta*	*Baltimore*	*Boston*	*Chicago*	*Dallas*
Salinas – Watsonville, CA	2,393	2,926	3,214	2,217	1,760
Santa Maria, CA	2,326	2,843	3,143	2,167	1,585
Orange and San Diego ctys ,CA	2,173	2,690	2,989	2,014	1,427
Oxnard District, CA	2,230	2,746	3,046	2,070	1,488
Mexico via Texas	1,785	2,837	3,474	2,194	700
Mexico via Otay Mesa	2,148	2,723	3,067	2,092	1,370
Central Florida, FL	499	964	1,374	1,214	1,140
East North Carolina, NC	373	323	732	786	1,153
South District, CA	2,173	2,689	2,989	2,013	1,426

Shipping point	*Los Angeles*	*Miami*	*New York*	*Philadelphia*	*Seattle*
Salinas-Watsonville, CA	303	3,033	2,992	2,980	894
Santa Maria, CA	158	2,890	2,942	2,863	1,051
Orange and San Diego ctys, CA	36	2,719	2,789	2,710	1,171
Oxnard District, CA	62	2,793	2,845	2,766	1,136
Mexico, via Texas	2,272	2,418	3,128	2,995	3,568
Mexico, via Otay Mesa	137	2,662	2,867	2,743	1,272
Central Florida	2,569	182	1.152	1,062	3,135
East North Carolina	2,524	788	510	420	2,820
South District, CA	37	2,719	2,788	2,709	1,172

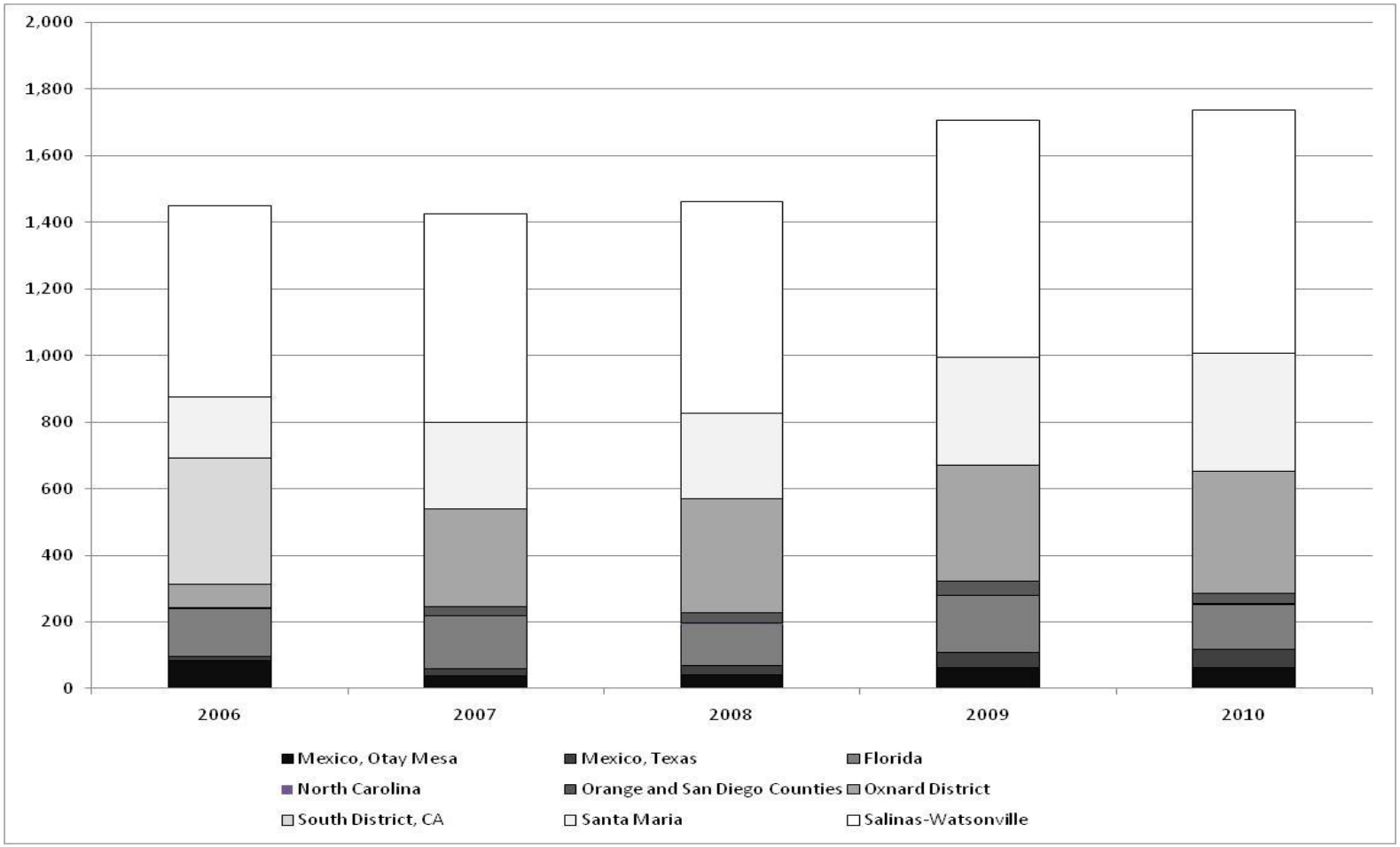

Figure 2.1: Volume shipments by shipping point district and year (millions of pounds)

CHAPTER 3

RESULTS

3.1 General Price and Margin Relationships

Figure 3.1(page 31) presents average prices at different levels of the marketing channel in order to provide an initial overview of the general patterns in prices and margins. The seasonal nature of these price series is very apparent in figure 3.1. Margins also show seasonality. The widest margins between the different levels of the marketing channel appear when strawberry prices are lowest, during the spring and summer. Margins narrow during the high-priced winter months. Price seasonality can be explained by seasonal production patterns. Figure 3.2 (page 32) shows shipments by week through the study period. Comparing figure 3.1 to 3.2 reveals a strong inverse relationship between shipment volumes and price levels. Figure 3.3(page 33) provides an overall average breakdown of the retail value of strawberries over the study period. Specifically, it shows the value that is reflected in the shipping point price, the shipping point to terminal (wholesale margin), and the terminal (wholesale) to retail margin. Shipping point prices represent about 51 cents of the final retail dollar, 23 cents represent the margin from the shipping point to terminal market, and the final 26 cents represent the margin from the terminal to retail market.

3.2 California Shipping Points and Marketing Margins

As shown if Figure 3.4 (page 34), shipping point locations in southern California supply the market for much of the year and are capable of hitting the peak price window. In 2006, strawberries were shipped from a district labeled "South District". However, based on data presented earlier in figure 2.1(page 20), it appears that much of the volume from this district has since been included in other Southern California Shipping Points. Prices from the various Southern California shipping points track very closely and are nearly identical on the chart. They also correspond closely to the average price over all shipping points.

Figure 3.5 shows the Central California shipping points, Salinas-Watsonville, and Santa Maria. These regions are very large suppliers and ship berries during the peak seasons when prices are low. However figure 3.5 (page 35) shows that the Santa Maria shipping point has a slightly longer market window and so it can benefit from the end-of-season increase in price. Again, shipping point prices in these regions are highly correlated and closely follow the average across all shipping point regions.

Figure 3.6 (page 36) reports the share of the consumer's dollar reflected in the shipping point price, the shipping point to terminal marketing margin, and the terminal to retail marketing margin. Figure 3.6 presents data for southern California shipping points and clearly shows a relationship between seasonal price patterns and marketing margins. When supplies are tight and prices peak, the shipping point price reflects a much higher share of the retail dollar and both shipping point to terminal and terminal to retail margins

narrow. Visually, figure 3.6 suggests that terminal to retail margins narrow the most, which may reflect a willingness on the part of retailers to absorb the higher fruit prices in the interest of maintaining a shelf presence in the strawberry category at a price that is palatable to the final consumer. While retailers appear to absorb higher fruit prices when supplies are tight they do not seem to be passing the lower prices on to consumers when supplies are abundant and fruit prices are low. Ultimately terminal to retail market margins widen as strawberry production peaks. Central California shipping points shown in Figure 3.7 are consistent with these observations. These shipping points supply berries during the peak production season and the share of retail value reflected in the shipping point price is quite a bit lower overall. With the possible exception of 2009, the shipping point share increased towards the end of the season and prices began to trend upwards.

3.3 Florida and North Carolina Shipping Points and Marketing Margins

Between the two regions of central and southern California, strawberries are supplied throughout the entire year. Florida and North Carolina, on the other hand, have much more compact seasons. Florida strawberries hit the market at seasonally high prices but that prices decline precipitously as the season progresses. As shown in figure 3.8 (page 38), the marketing season for North Carolina is even shorter, consisting of just 6 to 8 weeks during the late spring and early summer. North Carolina supplies the market when strawberry prices are at their seasonal lows. That said, the shipping point share of retail value is high for North Carolina relative to those observed in other regions during the same season. This may reflect a shipping cost advantage because North Carolina is close to some of the major east coast population centers in the eastern United States.

3.4 Average Behavior of Margins over the Study Period

Figure 3.9 (page 39) shows the terminal to retail market margin ($ per flat) over the study period averaged over the 10 terminal/retail market cities. Over time this margin averaged $6.76 per flat but had a high of $15.75 per flat and was negative in a four of the weeks reported. These negative margins occur before supplies start to pick up and may reflect periods when terminal markets are thin or when retailers source berries directly through shippers. A trend line is superimposed on figure 3.9. This trend shows that the terminal to retail marketing margin has been essentially flat over the study period. If anything it shows a very slight downward trend.

Figure 3.10(page) shows the shipping point to terminal marketing margin over the study period. The series presented in the figure represent an average over all shipping points and terminal market cities. Over the study period, this margin averaged between $4 to $6 per flat. There is evidence of a gradual upward trend in this series. Fuel and shipping prices increased over the period and this may be one cause of this trend. Interestingly, there does appear to be a break in the series corresponding to the drop in fuel prices that occurred in late 2008 and early 2009 at the onset of the financial crises.

3.5 Regression Analysis of Price Vertical Linkages

Descriptive Statistics for Variables Used in the Regression Models

Tables 3.1 (page 41) and 3.2 (page 42) report descriptive statistics for variables used in the regression models. In the interest of space, means for the weekly binary variables are omitted from the tables. As noted earlier in chapter 3, weekly retail prices were unavailable during the earlier part of the study period. Consequently, I am reporting means for two samples. Table 3.1 reports the full study period but only includes variables measured at the terminal market or shipping point market levels. Table 3.2 shows the restricted sample for which complete retail-level information was also available. The retail-level measure that are unique to Table 3.2 are retail price ($ per flat) and the Herfindahl-Hirschman index computed over the strawberry brands in the retail market. Other measures in table 3.2 are very similar in magnitude to those reported in Table 3.1In fact the range of the variables common to both tables are identical.

These descriptive statistics are instructive and provide some general information about the structure of the strawberry market. Because of the close similarity between tables 3.1 and 3.2, I will be referring to mean values in table 3.2. At the retail level, Herfindahl-Hirschman measure of concentration ranged from a low 0.155, indicating a relatively large number of competing brands in the retail marketplace to an upper limit of 0.989 which indicates one brand commanded over 99 percent of a retail market during at least one week. Concentration among shipping points varies similarly over the sample period as shown by the Herfindahl-Hirschman index computed over shipping point districts and these district's share of total supply. Variation in these statistics can be

explained by seasonal supply patterns shown earlier in this chapter. An interaction term between the district share and the Herfindahl-Hirshmann Index for districts was included in the regression models and so its mean value is also reported in tables 3.1 and 3.2 as well. Other measures presented in these tables have been discussed at length in the graphical analysis presented earlier.

Shipping Point to Terminal Market Regression Results

Table 3.3 (page 43) presents estimates for the shipping point to terminal market markup model. Seasonal binary variables were included in the regression models but are omitted in the interest of space. The interested reader can find full results in the Appendix. It should be pointed out that most of these binary variables are statistically significant. This is not surprising given the seasonal nature of fresh strawberry prices. Three different sets of results are presented. The first two are the same specification but the first is based on the full sample of 7,446 observations while the second is based on the sample for which I have retail-level observations. These first two sets of results are useful to determine whether findings are sensitive to choice of sample. The third set of results differs only in that it includes an additional explanatory variable, the retail-level Herfindahl-Hirschman index.

The overall fit of the model is very good with the R^2 value indicating that 86% to 88% of variability in shipping point prices is being explained by the model, depending on the sample being analyzed. This percentage is rather high which is a good sign of model specification is in general. All the coefficients in this model are significant at the 1%

level. Results are robust to the sample chosen and to the inclusion of the additional retail level explanatory variables.

Results are consistent with economic theory. There is a negative relationship between shipping costs (PPI x Miles) and shipping point prices. This is a measure of the costs of getting strawberries from the shipping point to the next stage of the market. Since demand at the shipping point level is a derived demand, economic theory would predict that an increase in marketing costs would shift this demand curve inwards and cause a resulting decrease in price (Schrimper, 2001). Results show that this is in fact the case. There is also the expected negative relationship between total volume of shipments (total supply) and shipping point price. Finally, the positive relationship between terminal market prices and shipping point prices indicates that terminal market increases/decreases do pass through to shipping point prices.

Three terms measure the supply-side structure of the market, the Herfindahl – Hirschman Index (H_S), the shipping point district share, and the interaction term between these two variables. Interestingly, the greater the Herfindahl-Hirschman index and the greater the district share, the lower the shipping point price. This indicates that prices are not higher when one shipping point region dominates the supply side of the market. In fact, it indicates that prices are significantly lower. This probably corresponds to the fact that when one region commands a large share of supply it is probably at the peak of its production season and so prices may otherwise be softening. The interaction term between these two concentration measures is positive indicating that when supplies in the overall market are highly concentrated and a given region has the dominant share, the negative price effect is ameliorated to some extent. However, the magnitude of the

interaction term is not large enough to offset the overall negative price effect of regional supply concentration.

Of even greater interest is the positive sign on the Herfindahl-Hirschman index at the retail level (H_R) in specification II of table 3.3. (page 43) Recall that this measures the degree of concentration among brands (typically major shippers) in a retail market. This indicates that as one brand dominates a retail market, prices at the shipping point level actually increase. Basic market power arguments would have suggested otherwise, but this finding may not be too surprising given the description of the strawberry market provided by Mohaparta et al. (2009) and summarized earlier in chapter 1. It could be that in cases of tight supply shippers place highest priority on meeting contractual obligations to retailers and the desire to meet these obligations may place upward pressure on prices.

Shipping Point to Retail Market Regression Results

Table 3.4(page 44) presents two specification of the shipping point to retail market mark up model. The first specification includes only retail price, while the second specification includes both the retail and terminal market price as explanatory variables. The interesting finding here is that in terms of price transmission, terminal market prices are very important to shipping point prices. R^2 increases from 0.83 to 0.88 when terminal market price is included in the model. In addition the magnitude of the retail price coefficient decreases dramatically when terminal market price is added back to the model. In general other covariates are robust to inclusion/exclusion of terminal market price in the shipping point to retail model. However, the magnitudes of some coefficients

for volume, shipping costs (PPI x Miles) and some of the market structure controls are sensitive to inclusion/exclusion of terminal market price.

Terminal Market to Retail Market Regression Results

Table 3.5 (page 45) presents estimates for the terminal market to retail market markup model. It is important to emphasize that in this model, the dependent variable is the terminal market price. At 0.67, the R^2 is lower than the shipping point models discussed above but indicates that two-thirds of the variance in terminal market prices is being explained by the model variables. Again, as in the shipping point models, weekly binary variables were included in the model but are not reported in the interest of space.

Findings in table 3.5 do conform to predictions of economic theory. There is the expected negative relationship between price at the terminal market and overall supply as measured by total shipment volume. The positive and statistically significant coefficient on retail price indicates that retail price increases/decreases do transmit back to the terminal market price. Finally, the positive statistically significant effect of shipping costs (PPI x Miles) is as economic theory would predict. Supply at the terminal market level represents derived supply. An increase in shipping costs causes derived supply to shift inwards and prices to rise (Schrimper, 2001).

The effects of the market structure measures do generally conform to explanations offered above for the shipping point models. Concentration among brands at the retail level has a positive impact on terminal market prices while concentration among supply regions has a negative impact. However the share supply volume originating from a

given district and the interaction term between volume and the Herfindahl-Hirschman index are not significant in the terminal market model.

Overall Economic Importance of Variables Influencing Fresh Strawberry Prices

Table 3.6 (page 46) presents price flexibility measures computed at the sample mean for each model specification derived above. In the shipping point price models, the variable that has the largest impact overall, is the terminal market price. Depending on specification, a one percent increase in the terminal market price translates into a 0.43 to 0.46 percent increase in shipping point price. Supply changes are the second most important measure of shipping point prices. A one percent increase in volume shipments translates into a 0.28 to 0.33 percent decrease in shipping point price. Interestingly, shipping costs (PPI x Miles) are relatively unimportant. A one percent increase in shipping costs translates into only a 0.06 to 0.07 percent decrease in shipping point prices. The terminal market model (rightmost column of table 3.6) is similar in that retail prices and total shipment volume are of most economic importance. A one percent increase in retail price causes a 0.65 percent increase in terminal market price and a one percent increase in volume causes a 0.28 percent decrease in terminal market price. Again, shipping costs are of relatively little economic significance to the magnitude of terminal market prices.

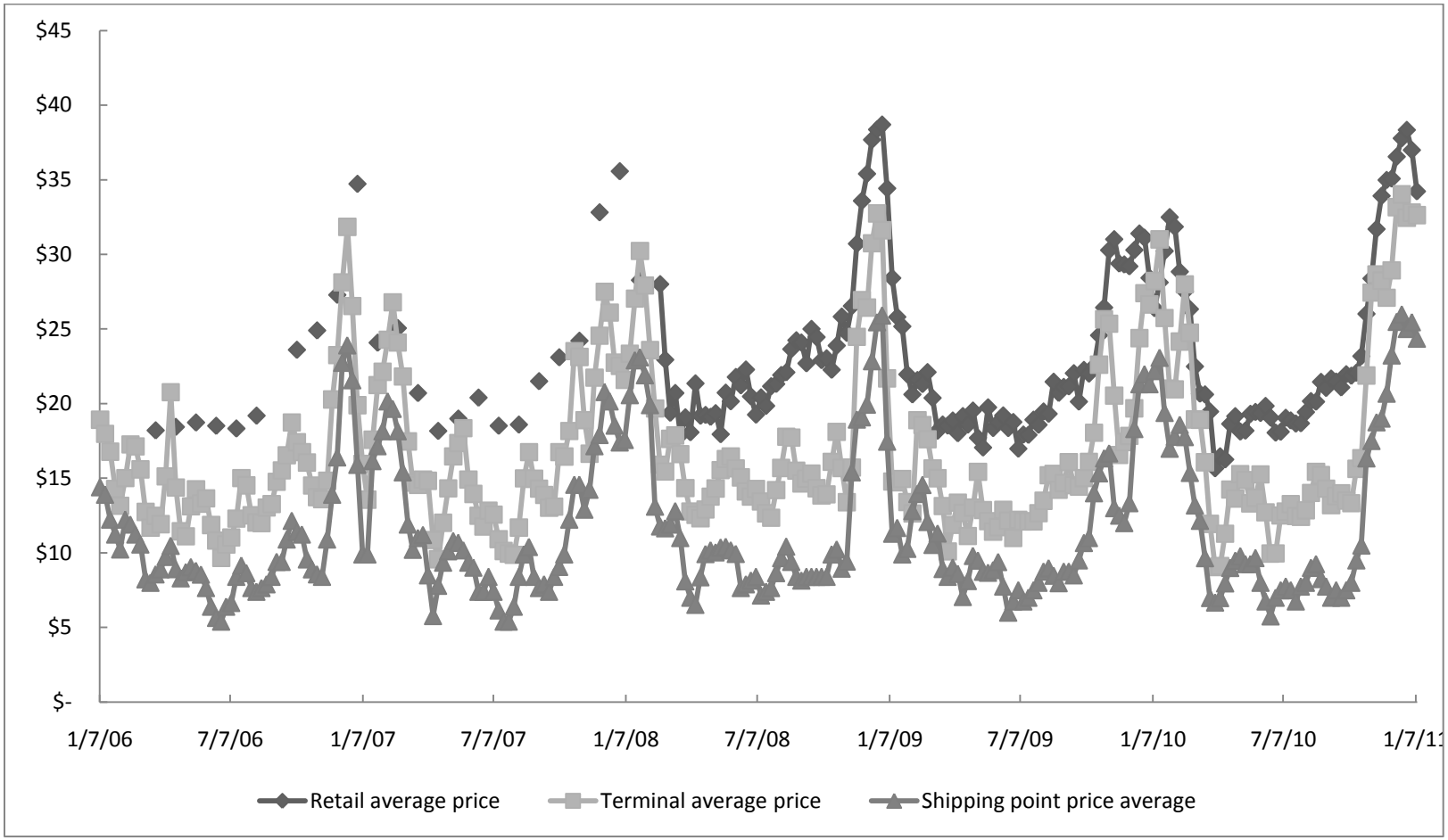

Figure 3.1: Average prices of strawberries at different levels of the market by week.(dollar per flat)

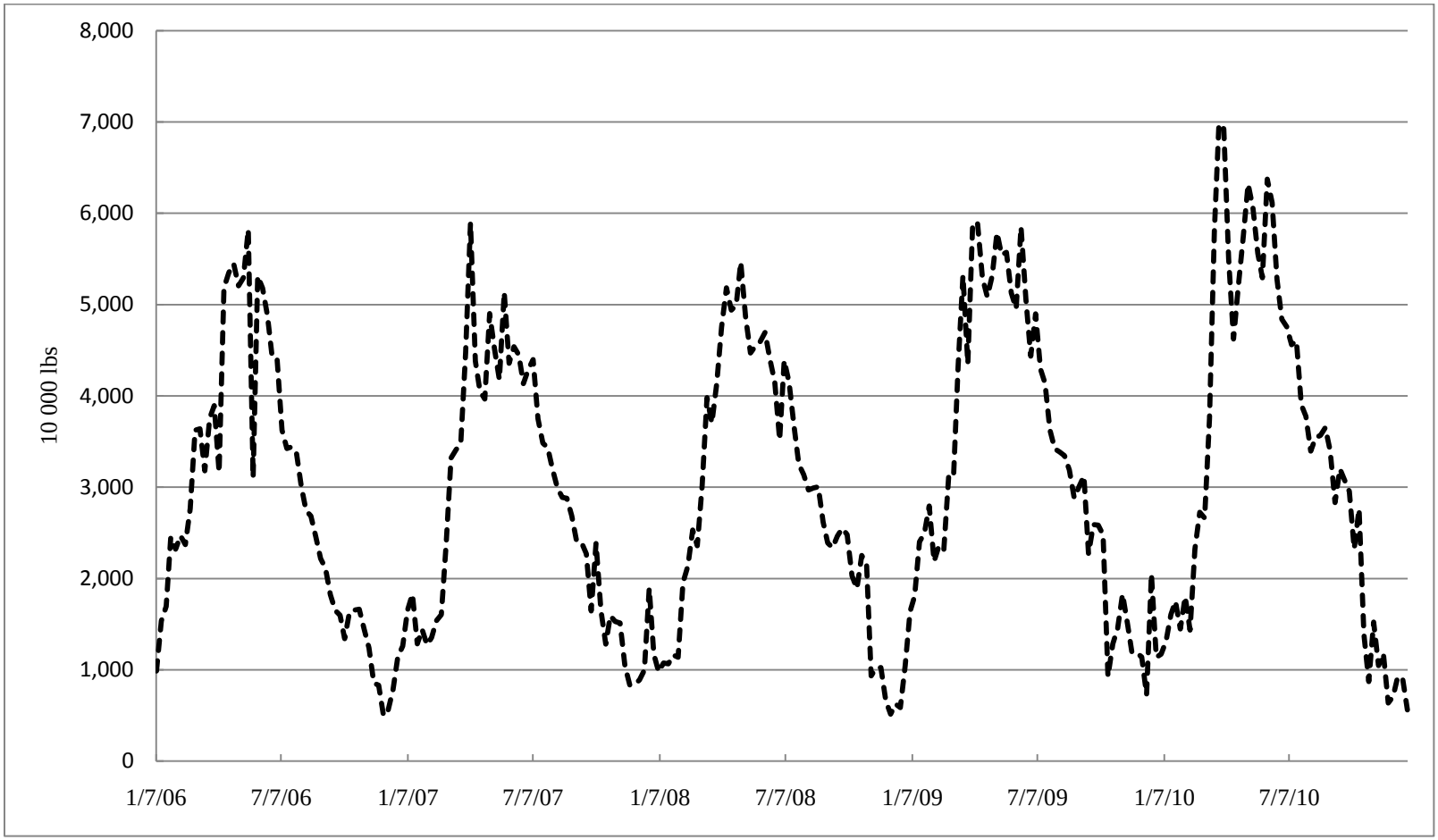

Figure 3.2: Total volumes of strawberries shipped by week.

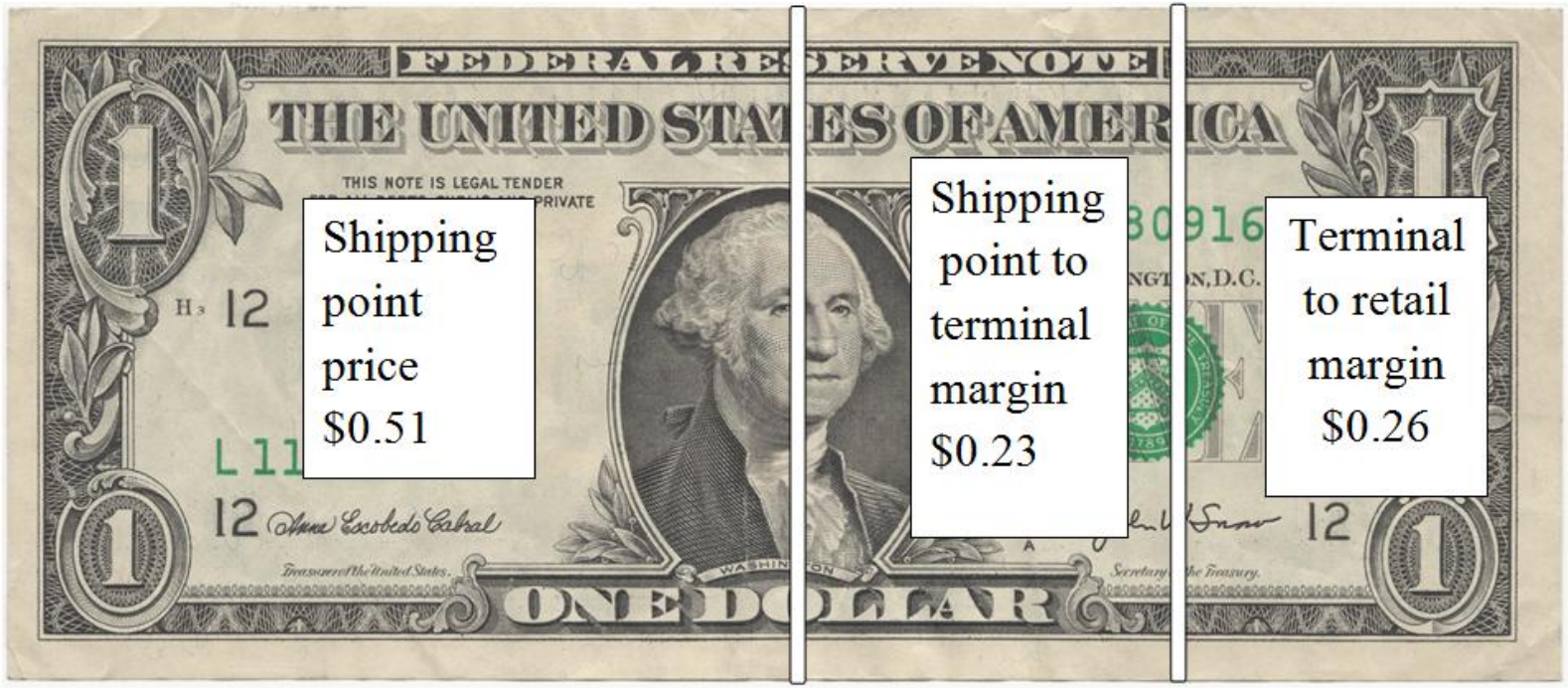

Figure 3.3: Distribution of retail value (Average over the study period)

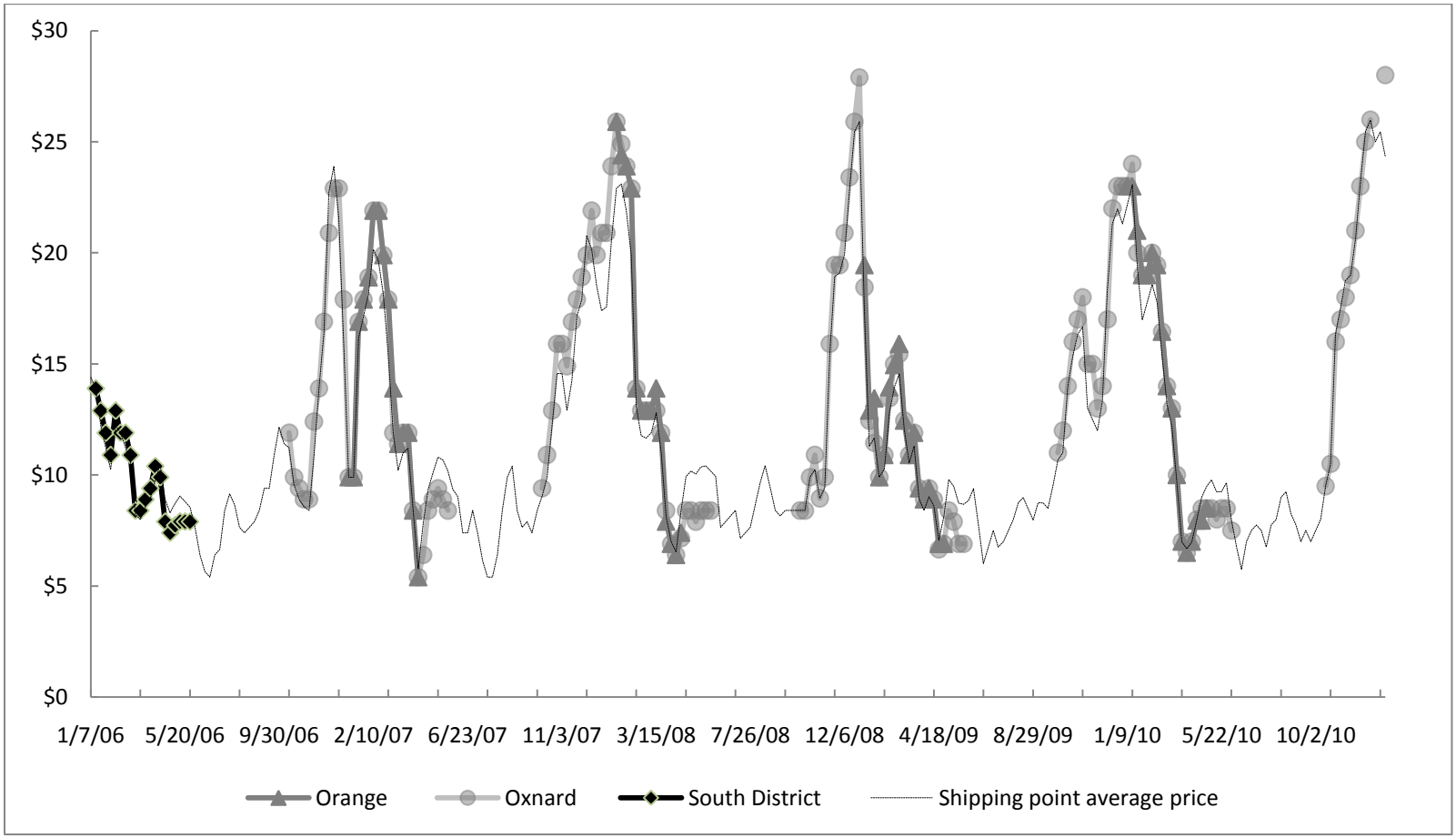

Figure 3.4: Southern CA shipping point prices by week (Orange and San Diego Counties, Oxnard District and South District). Note that the South District was only reported in 2006

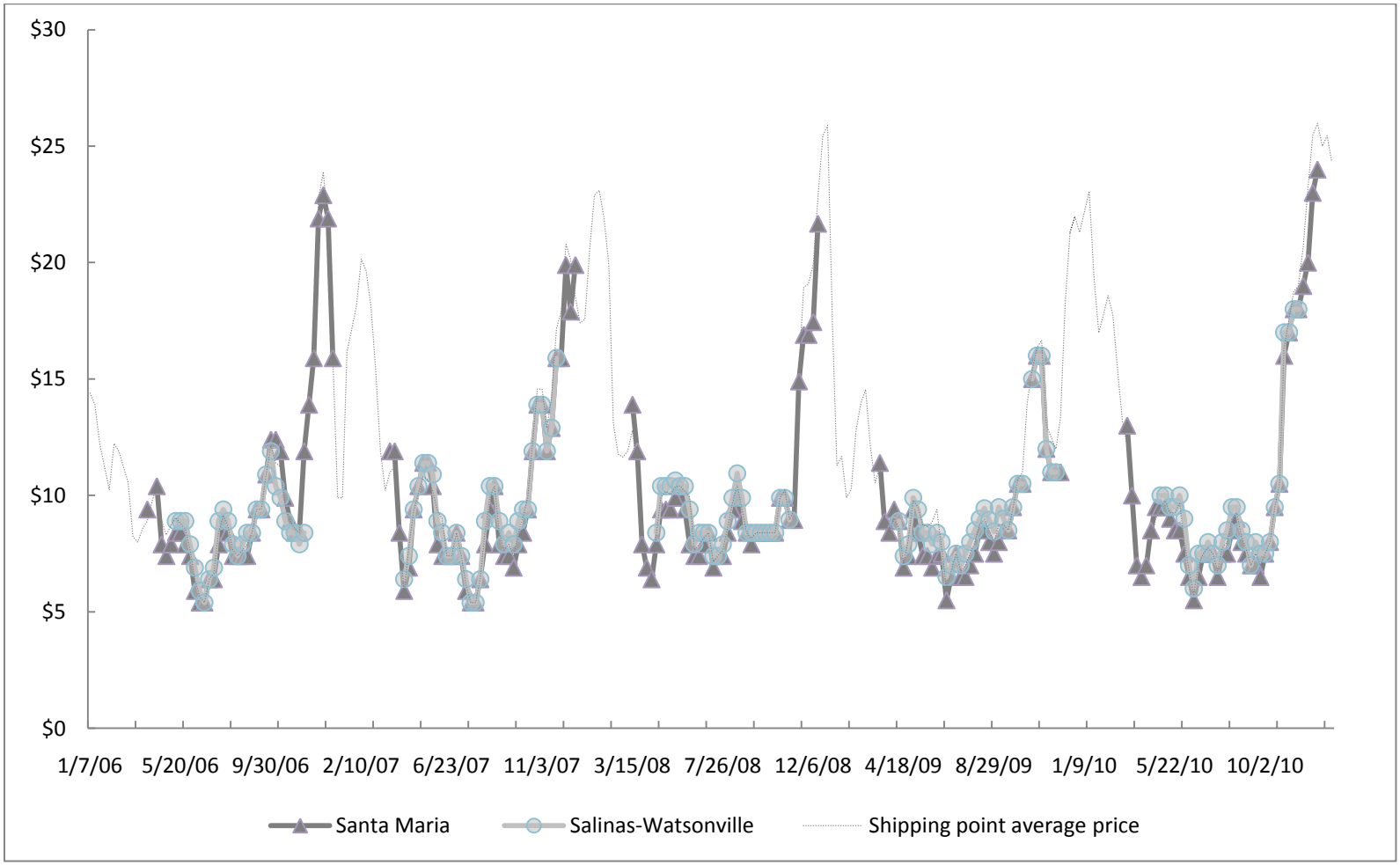

Figure 3.5: Central CA shipping point prices by week(Salinas-Watsonville and Santa Maria Districts)

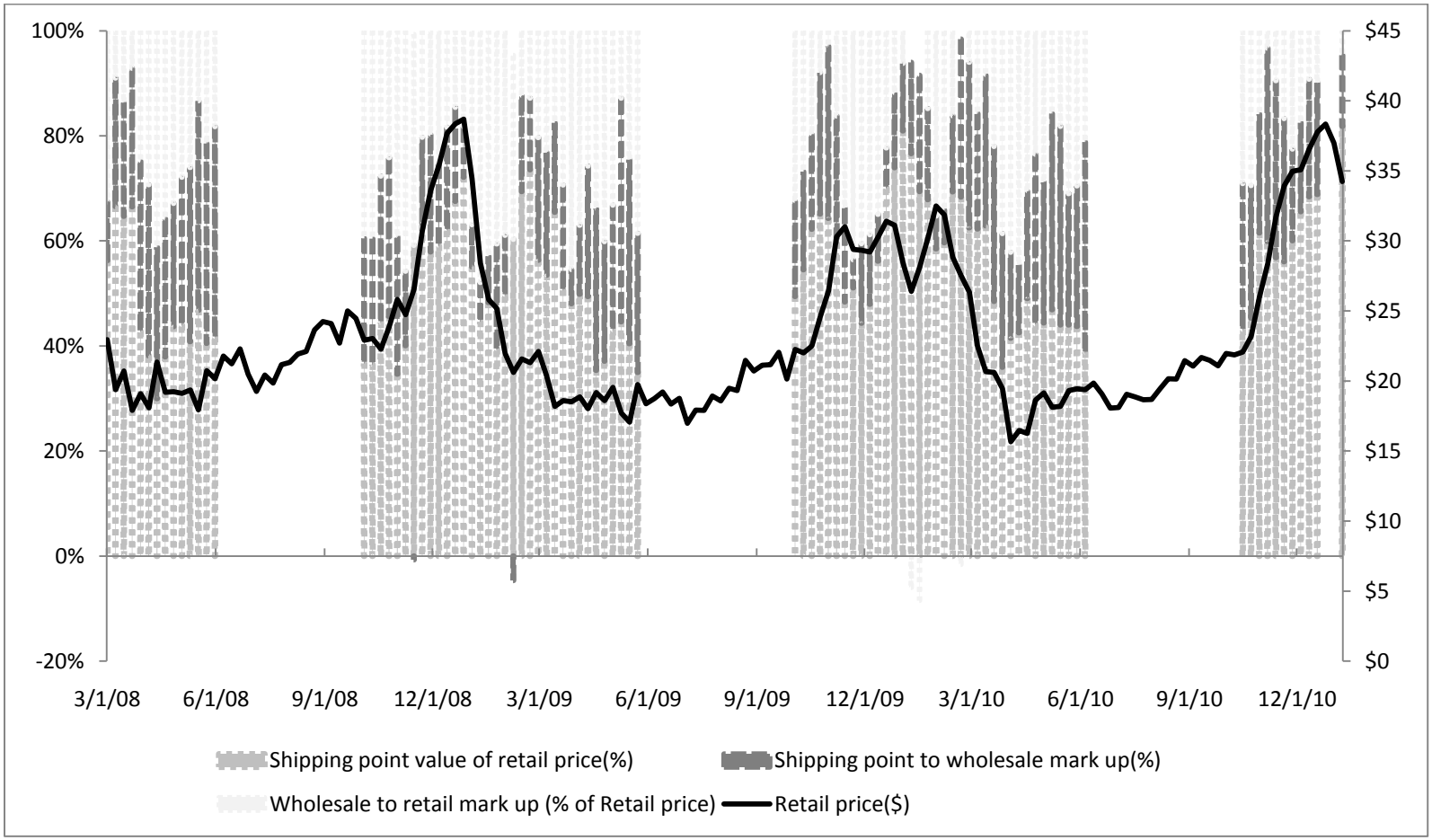

Figure 3.6: Distribution of retail value to different stages of the market by week (Southern California districts)

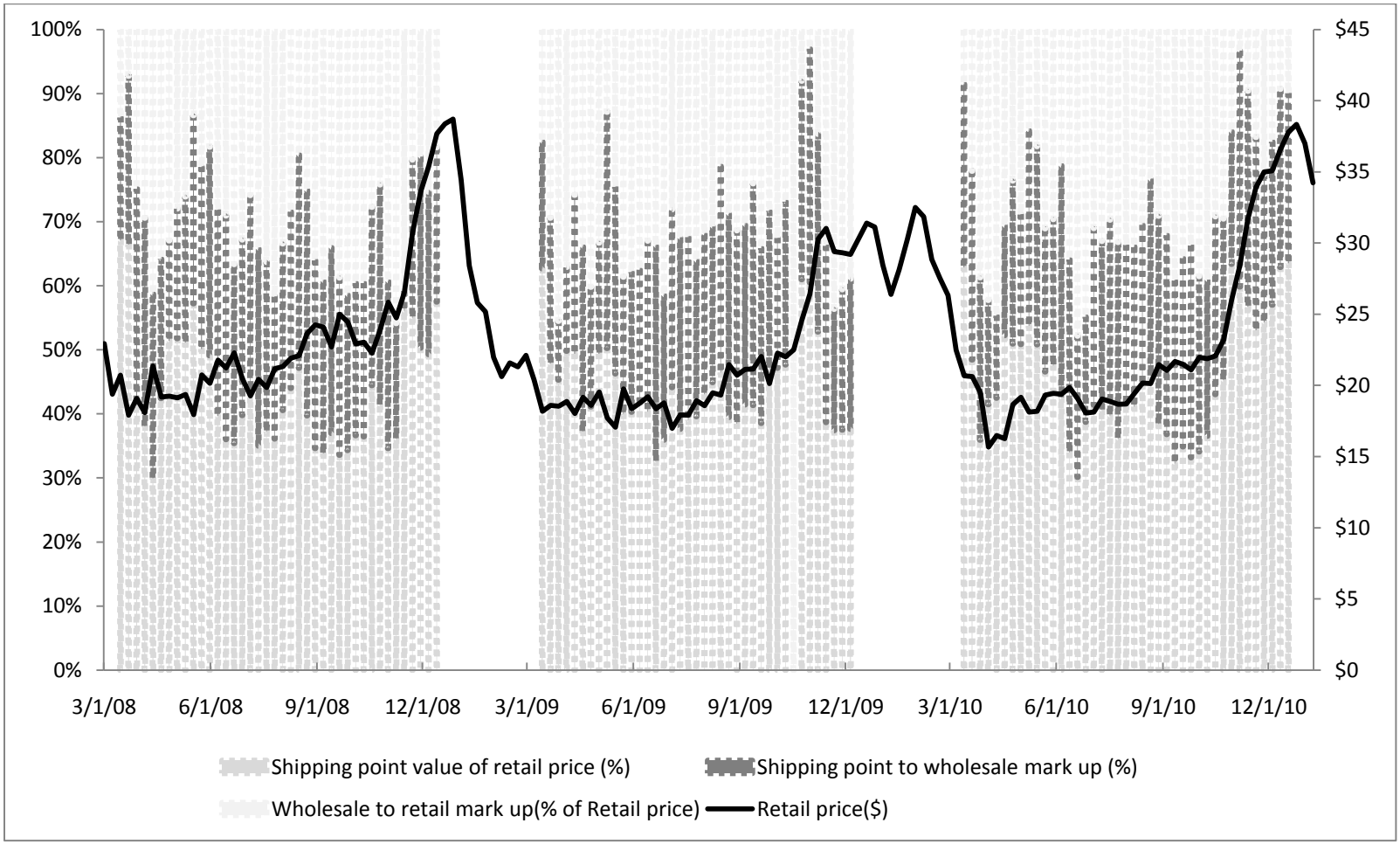

Figure 3.7: Distribution of retail value to different stages of the market by week (Central California districts)

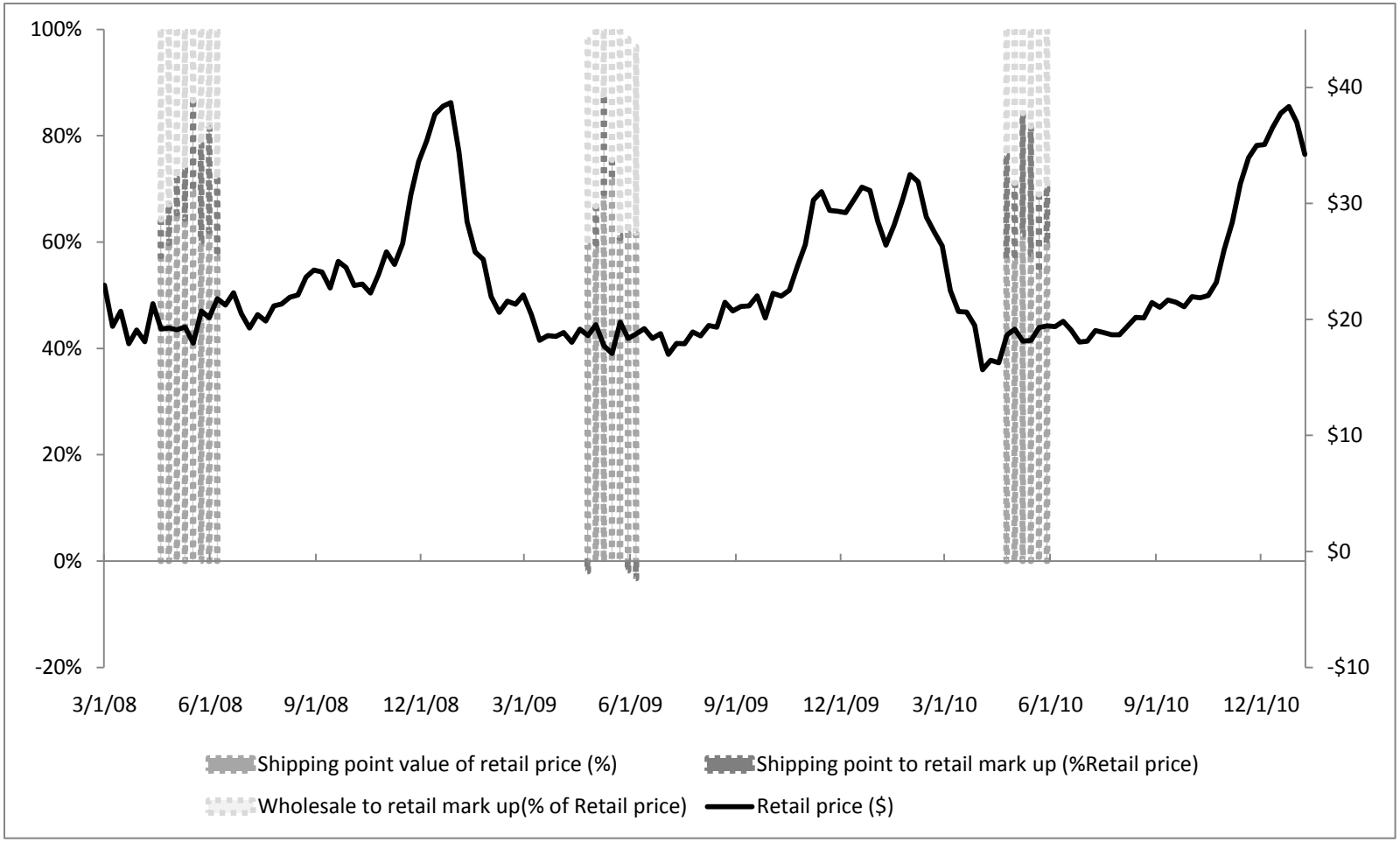

Figure 3.8: Distribution of retail value to different stages of the market by week (North Carolina)

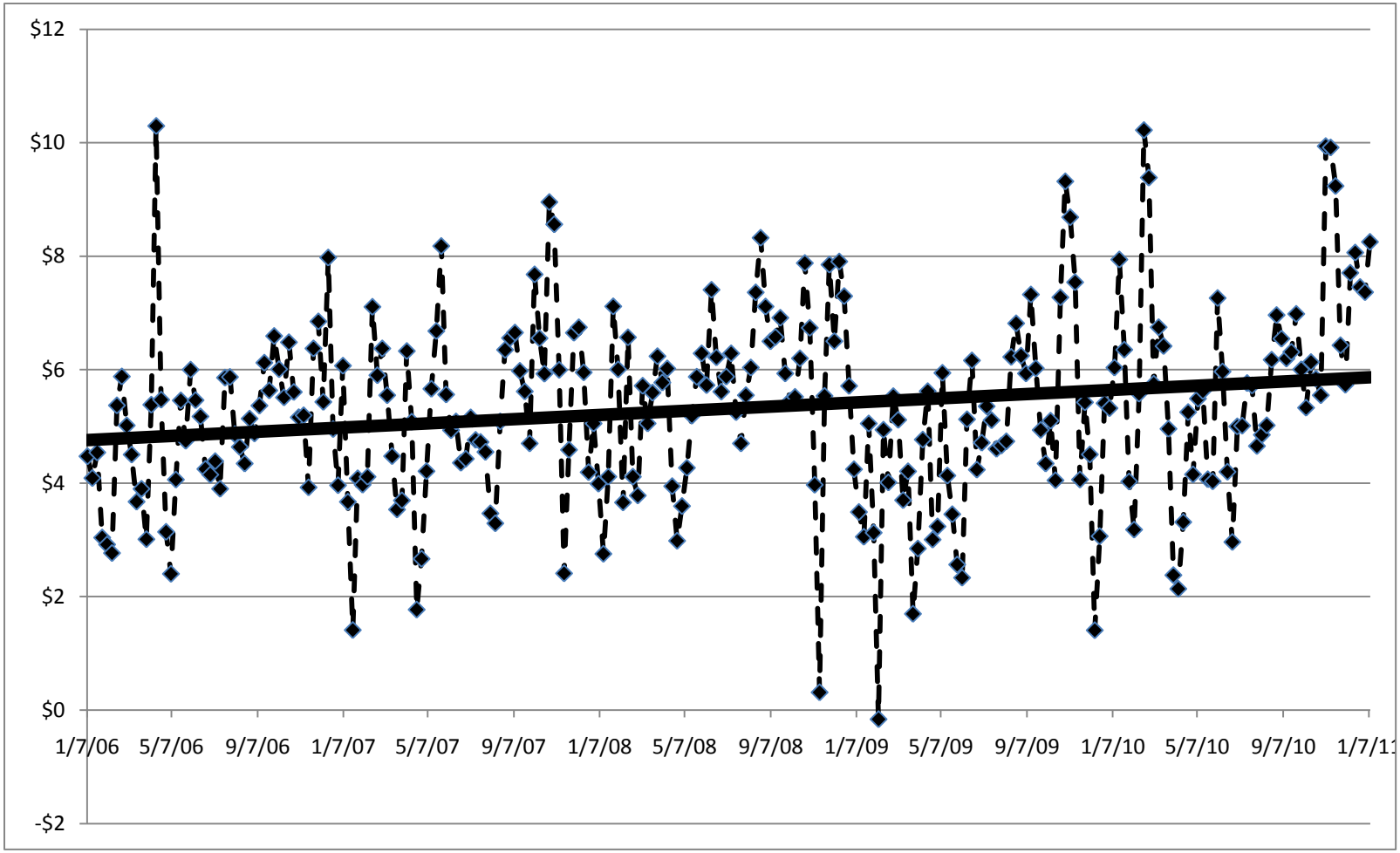

Figure 3.9: Average terminal market to retail market margins by week ($ per flat of eight one-pound containers).

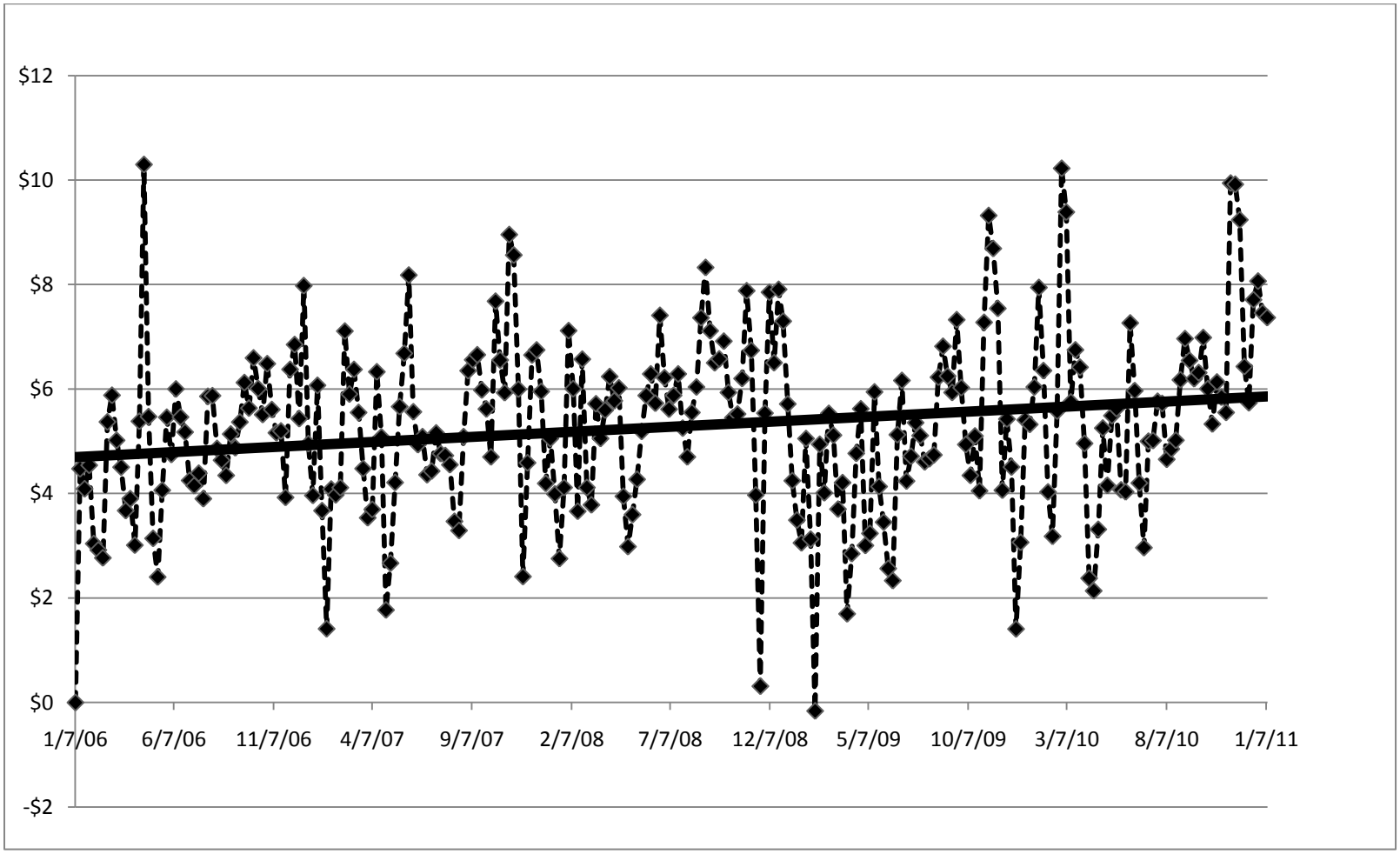

Figure 3.10: Average shipping point to terminal market margins by week ($ per flat of eight one-pound containers).

Table 3.1: Descriptive statistics over the full sample period

Variable	*Number of observations*	*Mean*	*Standard Deviation*	*Minimum*	*Maximum*
H_S [a]	7446	0.453	0.180	0.208	0.946
District Share	7446	0.311	0.262	0.001	0.973
H_S x District Share	7446	0.158	0.193	0.000	0.920
Terminal Market Price	7446	17.345	6.588	5.250	43.900
PPI x Miles	7446	2665.800	1268.070	44.712	4773.980
Shipping price	7446	12.059	5.198	5.400	28.000
Total Volume	7446	3078.820	1684.300	497.000	6977.000

[a] Herfindahl-Hirschman index computed over volume shares from shipping point locations

Table 3.2*:* Descriptive statistics over the restricted sample for which retail-level observations are available

Variable	*Number of observations*	*Mean*	*Standard Deviation*	*Minimum*	*Maximum*
H_R [a]	5122	0.406	0.160	0.155	0.989
H_S [b]	5122	0.444	0.181	0.208	0.946
District Share	5122	0.302	0.257	0.001	0.973
Hs x District Share	5122	0.153	0.189	0.000	0.920
Terminal Market Price	5122	17.386	6.787	5.250	43.900
Shipping price	5122	12.000	5.234	5.400	28.000
PPI x Miles	5122	2702.240	1266.290	44.712	4773.98
Retail Price	5122	23.363	6.368	9.047	44.224
Total Volume	5122	3252.410	1736.670	497	6977

[a] Herfindahl-Hirschman index computed over dollar shares for strawberry brands in the retail market.

[b] Herfindahl-Hirschman index computed over volume shares from shipping point locations

Table 3.3: Shipping point to terminal market markup model (dependent variable is shipping point price)[a]

	Full Sample Specification 1		*Retail Sample Specification 1*		*Retail Sample Specification 2*	
Intercept	16.6702*	(64.33)	18.6145*	(56.09)	18.258*	(52.70)
H_R [b]					0.6396*	(3.53)
H_S [c]	-8.8674*	(-22.2)	-9.5170*	(-16.57)	-9.444*	(-16.45)
District Share	-6.0376*	(-20.40)	-4.9534*	(-14.00)	-4.9544*	(-14.01)
Hs x (District Share)	8.47128*	(17.99)	7.2745*	(12.87)	7.2778*	(12.89)
Terminal Market Price	0.3217*	(61.45)	0.3005*	(49.80)	0.323*	(49.98)
PPI x Miles	-2.6 EE-4*	(-13.87)	-3.0 EE-4*	(-15.03)	-3.6 EE-4*	(-15.18)
Total Volume	-1.10 EE -3*	(-24.71)	-1.19EE-3*	(-22.55)	-1.2EE-3*	(-22.72)
Number of Observations	7446		5122		5122	
R^2	0.86		0.88		0.88	

[a] An asterisk denotes significance at the 1% level ; t-ratios are in parentheses
[b] Herfindahl-Hirschman index computed over dollar shares for strawberry brands in the retail market
[c] Herfindahl-Hirschman index computed over volume shares from shipping point locations

Table 3.4: Shipping point to retail market markup model (dependent variable is shipping point price)[a]

	Specification 1		*Specification2*	
Intercept	22.1329*	(46.41)	17.7726*	(43.04)
H_R [b]	1.1994*	(5.30)	0.7713*	(4.04)
H_S [c]	-13.4883*	(-20.04)	-9.4711*	(-16.51)
District Share	-4.9764*	(-11.87)	-4.9530*	(-14.02)
Hs x District Share	7.3131*	(10.91)	7.2781*	(12.90)
Terminal Market Price			0.2970*	(45.55)
PPI x Miles	-1.45 EE-4*	(-6.06)	-3.24 EE-4*	(-15.34)
Retail Price	0.1614*	(17.47)	0.0181	(2.16)
Total Volume	-1.63 EE-3*	(-26.47)	-1.1EE-3*	(-22.60)
Number of Observations	5122		5122	
R^2	0.83		0.88	

[a] An asterisk denotes significance at the 1% level ; t-ratios are in parentheses
[b] Herfindahl-Hirschman index computed over dollar shares for strawberry brands in the retail market
[c] Herfindahl-Hirschman index computed over volume shares from shipping point locations

Table 3.5: Terminal market to retail market markup model (dependent variable is terminal market price)[a]

Intercept	14.6791*	(16.96)
H_R [b]	1.4410*	(3.51)
H_S [c]	-13.5236*	(-11.07)
District Share	-0.08	(-0.103)
Hs x (District Share)	0.12	(0.097)
PPI x Miles	5.88 EE-4*	(13.12)
Retail Price	0.4826*	(28.77)
Total Volume	-1.47EE-3*	(-13.19)
Number of Observations	5122	
R^2	0.67	

[a] An asterisk denotes significance at the 1% level ; t-ratios are in parentheses
[b] Herfindahl-Hirschman index computed over dollar shares for strawberry brands in the retail market
[c] Herfindahl-Hirschman index computed over volume shares from shipping point locations

Table 3.6: Price flexibilities computed at the sample mean[a]

	Shipping point to terminal			*Shipping point to retail*		*Terminal to retail*
Sample (Specification)	Full (1)	Retail (1)	Retail (2)	(1)	(2)	
H_R [b]			0.02	0.04	0.03	0.03
H_S [c]	-0.23	-0.27	-0.27	-0.42	-0.27	-0.34
District Share	-0.06	-0.04	-0.04	-0.04	-0.04	-0.0005
Terminal Market Price	**0.46**	**0.44**	**0.44**		**0.43**	
PPI x Miles	-0.06	-0.07	-0.07	-0.03	-0.07	0.09
Retail Price				0.31	0.04	**0.65**
Total Volume	-0.28	-0.32	-0.33	**-0.44**	-0.32	-0.28

[a] Bolded numbers indicate highest magnitude
[b] Herfindahl-Hirschman index computed over dollar shares for strawberry brands in the retail market
[c] Herfindahl-Hirschman index computed over volume shares from shipping point locations

CHAPTER 4

CONCLUSIONS

The main goal of this thesis was to provide information regarding the marketing margin for strawberries during 2006 -2010. Data were obtained at the shipping point and terminal market levels from the Historic Market News portal provided by USDA AMS. Data at the retail level of the market were obtained from the Nielsen Company. All data were on a weekly basis which helped in conducting the econometric model. Early pioneers in the analysis of marketing margins were George and King (1971) and their model provided the empirical framework for this thesis

A few key contributions of this thesis include a better understanding of how the strawberry market works in the United States. Of specific focus was how prices are transmitted between different levels of the marketing channel and the role of structural characteristics that change across time and over the different geographies that were included in my sample. Fresh fruits have unique attributes compared to other commodities because they are highly perishable and require few additional steps after leaving the farm.

Another aspect of this thesis is to account for the impact of highly volatile shipping prices that have been observed in recent years. I find that shipping costs affects prices in the directions predicted by economic theory. That is, increases in shipping costs depressed shipping point prices and raised terminal market prices. This means that a portion of the increase in shipping costs is passed back towards the farm level in the form of lower prices and a portion is passed forward to the consumer in the form of higher

prices at the retail level. However, actual magnitude of the impact of shipping costs on prices was quite low.

The key driver of fresh strawberry prices at one level of the market was the price at the next level downstream in the marketing channel. This was followed in importance by total supply. Seasonality had quite a big impact on prices. Seasonality in strawberries has a significant impact on the price and quantity of the strawberries. Measure of market structure also impacted strawberry prices but not necessarily in the expected fashion. Retail concentration among brands (typically the labels of major shippers) increased price at both the shipping point and terminal market levels. This is probably best explained by the highly perishable nature of the strawberries and contractual obligations with retailers. The practical logistics of supplying the market may cause prices to be bid up when shippers try to fill obligations to retail customers when supplies are tight. In terms of overall economic importance, my findings suggest that concentration among retail brands did not matter very much. Of more importance was concentration among shipping point regions. However, prices in both shipping point and terminal markets were lower when one specific supply region dominated the market.

Overall the findings presented were robust to differences in the sample and to differences in model specification. The fit of the models was very good. However, I think it would be useful in the future to examine additional forms of marketing costs. My measure of marketing costs in this thesis was shipping costs. Since my period of study consisted of only three to five years, I did not include labor costs. However, geographic differences in labor costs across the terminal/retail market cities and the different shipping point locations may be important and should be included in future models.

Also, I think it would be interesting to include opportunity costs of participants through the vertical chain. This could be done by examining strawberry prices along with other competing fruit products. In general it would be useful in follow-up studies to focus more specifically on demand drivers that are influencing this market.

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APPENDIX

FULL ESTIMATION RESULTS FOR MODELS PRESENTED IN THIS THESIS

Full Sample: Shipping Point to Terminal Markup (Dependent Variable is Shipping Point Price)[a]

	Full Sample Specification		*Retail Sample Specification I.*		*Retail Sample Specification II.*	
Intercept	16.6702*	(64.34)	18.6146*	(56.09)	18.2580*	(52.7)
d2	0.6066*	(3.17)	-1.0023*	(-3.78)	-0.9795*	(-3.7)
d3	-0.7665*	(-3.95)	-1.6099*	(-7.74)	-1.6090*	(-7.74)
d4	-0.5547	(-2.87)	-2.7788*	(-10.5)	-2.7306*	(-10.32)
d5	0.3339	(1.72)	-1.9032*	(-6.99)	-1.8508*	(-6.79)
d6	-1.2453*	(-6.44)	-1.9993*	(-7.61)	-1.9760*	(-7.53)
d7	-1.3654*	(-6.88)	-2.2614*	(-10.68)	-2.2714*	(-10.74)
d8	-2.2156*	(-10.92)	-3.6483*	(-15.27)	-3.6213*	(-15.17)
d9	-2.7707*	(-13.19)	-4.2234*	(-17.34)	-4.2077*	(-17.29)
d10	-2.1950*	(-10.27)	-2.8080*	(-11.3)	-2.8080*	(-11.31)
d11	-2.4181*	(-10.61)	-3.2220*	(-12.53)	-3.2163*	(-12.52)
d12	-2.3773*	(-9.78)	-3.6178*	(-12.76)	-3.5841*	(-12.65)
d13	-1.5792*	(-6.06)	-2.2795*	(-7.03)	-2.1971*	(-6.76)
d14	-2.4402*	(-9.82)	-2.4868*	(-7.92)	-2.3588*	(-7.47)
d15	-2.3170*	(-9.88)	-3.4918*	(-13.21)	-3.3428*	(-12.5)
d16	-1.6039*	(-6.85)	-2.3461*	(-8.45)	-2.1835*	(-7.77)
d17	-0.8082*	(-3.24)	-1.7154*	(-5.76)	-1.5418*	(-5.12)
d18	-1.1887*	(-4.76)	-2.0909*	(-6.85)	-1.9295*	(-6.26)
d19	-1.6613*	(-6.91)	-2.6129*	(-9.59)	-2.4385*	(-8.81)
d20	-1.3737*	(-5.55)	-2.1977*	(-7.78)	-2.0415*	(-7.07)
d21	-1.9267*	(-8.42)	-2.0219*	(-6.94)	-1.8686*	(-6.35)
d22	-0.9668*	(-3.65)	-1.5606*	(-4.84)	-1.4170*	(-4.37)

[a] *An asterisk denotes significance at the 1% level ; t-ratios are in parentheses*

Full Sample: Shipping Point to Wholesale Terminal (Dependent Variable is Shipping Point Price)

	Full Sample Specification 1		*Retail Sample Specification 1*		*Retail Sample Specification 2*	
d23	-1.3410*	(-4.5)	-2.0628*	(-5.89)	-1.9280*	(-5.48)
d24	-1.8376*	(-6.23)	-2.6965*	(-7.55)	-2.5742*	(-7.18)
d25	-1.3823*	(-4.72)	-2.1413*	(-5.77)	-2.0200*	(-5.42)
d26	-1.1082*	(-3.72)	-1.6767*	(-4.42)	-1.5618*	(-4.11)
d27	-1.9488*	(-6.65)	-2.6200*	(-7.28)	-2.5094*	(-6.95)
d28	-1.8857*	(-6.43)	-2.2919*	(-6.37)	-2.1978*	(-6.1)
d29	-2.1831*	(-7.54)	-2.9246*	(-7.88)	-2.8504*	(-7.67)
d30	-1.8647*	(-6.54)	-2.5353*	(-6.97)	-2.4760*	(-6.8)
d31	-1.6532*	(-5.83)	-2.3562*	(-6.87)	-2.2786*	(-6.63)
d32	-1.4727*	(-5.17)	-2.3419*	(-6.65)	-2.2708*	(-6.44)
d33	-1.7437*	(-6.05)	-2.6648*	(-7.28)	-2.5852*	(-7.05)
d34	-2.5107*	(-8.75)	-3.2208*	(-8.64)	-3.1327*	(-8.4)
d35	-2.5631*	(-8.89)	-3.4717*	(-9.88)	-3.3868*	(-9.62)
d36	-2.7041*	(-9.58)	-3.2746*	(-9.05)	-3.2003*	(-8.84)
d37	-3.1152*	(-11.36)	-3.8505*	(-10.75)	-3.7766*	(-10.54)
d38	-2.8269*	(-10.63)	-3.5951*	(-10.18)	-3.5158*	(-9.94)
d39	-2.8156*	(-12.08)	-3.9714*	(-14.51)	-3.9015*	(-14.23)
d40	-3.5884*	(-16.52)	-4.2536*	(-16.24)	-4.2076*	(-16.06)
d41	-3.5525*	(-16.92)	-4.4593*	(-16.37)	-4.4213*	(-16.24)

[a] *An asterisk denotes significance at the 1% level ; t-ratios are in parentheses*

Full Sample: Shipping Point to Terminal Markup (Dependent Variable is Shipping Point Price)

	Full Sample Specification 1		*Retail Sample Specification 1.*		*Retail Sample Specification 2.*	
d43	-3.5997*	(-18.44)	-4.3627*	(-20.39)	-4.3075*	(-20.1)
d44	-3.3145*	(-17.11)	-4.4842*	(-21.14)	-4.4492*	(-20.98)
d45	-2.8777*	(-15.06)	-3.5575*	(-15.77)	-3.5179*	(-15.59)
d46	-2.0303*	(-11.08)	-3.2527*	(-14.54)	-3.2067*	(-14.33)
d47	-1.9256*	(-9.81)	-3.0890*	(-14.56)	-3.0363*	(-14.29)
d48	-0.4104	(-2.12)	-1.6968*	(-7.88)	-1.6629*	(-7.73)
d49	1.4523*	(7.64)	0.5129	(2.22)	0.5332	(2.31)
d50	2.9690*	(15.52)	2.6453*	(11.33)	2.6745*	(11.46)
d51	2.8402*	(13.13)	1.7574*	(7.32)	1.7424*	(7.26)
H_R [b]					-0.6396*	(-3.53)
$H_{S\,c}$	-8.8674*	(-22.2)	-9.5170*	(-16.58)	-9.444*	(-16.46)
District Share	-6.03*	(-20.4)	-4.9534*	(-14.02)	-4.9544*	(-14.02)
Hs x District Share	-8.4712*	(-17.99)	7.2745*	(12.87)	7.2778*	(12.89)
Terminal Market Price	-0.3217*	(-61.54)	-0.3005*	(-15.03)	0.323*	(3.54)
PPI x Miles	-2.6 EE-4*	(-13.87)	-3.0 EE-4*	(-22.55)	-3.6 EE-4*	(-15.19)
Total Volume	-1.10EE-3*	(-24.72)	-1.19EE-3*	(-49.81)	-1.2EE-3*	(-22.72)
Number of Observations		7446		5122		5122
R^2		0.86		0.88		0.88

[a] *An asterisk denotes significance at the 1% level ; t-ratios are in parentheses*

[b] *Herfindahl-Hirschman Index computed over strawberries towards shippers at the retail level*

[c] *Herfindahl-Hirschman Index computed over shipping point regions*

	Specification 1		Specification 2	
Intercept	22.1330*	(46.41)	17.7726*	(43.04)
d2	-0.6980	(-2.21)	-0.9099*	(-3.41)
d3	-1.5448*	(-6.20)	-1.5463*	(-7.37)
d4	-4.3500*	(-13.97)	-2.7091*	(-10.23)
d5	-3.7222*	(-11.63)	-1.8175*	(-6.66)
d6	-2.1575*	(-6.86)	-1.8951*	(-7.15)
d7	-2.0269*	(-7.96)	-2.1943*	(-10.23)
d8	-3.7219*	(-12.92)	-3.5257*	(-14.53)
d9	-4.4946*	(-15.10)	-4.0757*	(-16.25)
d10	-2.4475*	(-8.04)	-2.6683*	(-10.41)
d11	-3.1740*	(-10.13)	-3.0835*	(-11.68)
d12	-3.8643*	(-11.24)	-3.4535*	(-11.93)
d13	-2.0761*	(-5.25)	-2.0388*	(-6.12)
d14	-2.1719*	(-5.64)	-2.1990*	(-6.78)
d15	-3.5985*	(-10.89)	-3.1728*	(-11.39)
d16	-1.8083*	(-5.22)	-2.0144*	(-6.92)
d17	-1.2639*	(-3.43)	-1.3827*	(-4.46)
d18	-1.0567	(-2.79)	-1.7504*	(-5.48)
d19	-1.5757*	(-4.57)	-2.2438*	(-7.71)
d20	-1.5805*	(-4.48)	-1.8873*	(-6.35)
d21	-1.3630*	(-3.78)	-1.7060*	(-5.62)
d22	-0.5768	(-1.47)	-1.2653	(-3.81)

[a] *An asterisk denotes significance at the 1% level ; t-ratios are in parentheses*

	Specification 1		Specification 2	
Intercept	22.1330*	(46.41)	17.7726*	(43.04)
d2	-0.6980	(-2.21)	-0.9099*	(-3.41)
d3	-1.5448*	(-6.20)	-1.5463*	(-7.37)
d4	-4.3500*	(-13.97)	-2.7091*	(-10.23)
d5	-3.7222*	(-11.63)	-1.8175*	(-6.66)
d6	-2.1575*	(-6.86)	-1.8951*	(-7.15)
d7	-2.0269*	(-7.96)	-2.1943*	(-10.23)
d8	-3.7219*	(-12.92)	-3.5257*	(-14.53)
d9	-4.4946*	(-15.10)	-4.0757*	(-16.25)
d10	-2.4475*	(-8.04)	-2.6683*	(-10.41)
d11	-3.1740*	(-10.13)	-3.0835*	(-11.68)
d12	-3.8643*	(-11.24)	-3.4535*	(-11.93)
d13	-2.0761*	(-5.25)	-2.0388*	(-6.12)
d14	-2.1719*	(-5.64)	-2.1990*	(-6.78)
d15	-3.5985*	(-10.89)	-3.1728*	(-11.39)
d16	-1.8083*	(-5.22)	-2.0144*	(-6.92)
d17	-1.2639*	(-3.43)	-1.3827*	(-4.46)
d18	-1.0567	(-2.79)	-1.7504*	(-5.48)
d19	-1.5757*	(-4.57)	-2.2438*	(-7.71)
d20	-1.5805*	(-4.48)	-1.8873*	(-6.35)
d21	-1.3630*	(-3.78)	-1.7060*	(-5.62)
d22	-0.5768	(-1.47)	-1.2653	(-3.81)

[a] *An asterisk denotes significance at the 1% level ; t-ratios are in parentheses*

	Retail Sample Specification 1		Retail Sample Specification 2.	
d23	-1.01573	(-2.39)	-1.77938*	(-4.96)
d24	-1.91115*	(-4.41)	-2.42007*	(-6.62)
d25	-1.44748*	(-3.21)	-1.85294*	(-4.87)
d26	-0.30768	(-0.67)	-1.37519*	(-3.53)
d27	-1.60763*	(-3.67)	-2.33628*	(-6.32)
d28	-1.23345	(-2.81)	-2.01924*	(-5.46)
d29	-2.30037*	(-5.12)	-2.69115*	(-7.11)
d30	-1.77725*	(-4.03)	-2.31328*	(-6.23)
d31	-1.58891*	(-3.81)	-2.11268*	(-6.25)
d32	-1.12344	(-2.63)	-2.10466*	(-5.84)
d33	-1.30398	(-2.95)	-2.43915*	(-6.55)
d34	-2.23086*	(-4.97)	-2.99573*	(-7.92)
d35	-2.68632*	(-6.33)	-3.24772*	(-9.08)
d36	-2.31022*	(-5.29)	-3.05223*	(-8.28)
d37	-3.43569*	(-7.99)	-3.65647*	(-10.09)
d38	-3.1271*	(-7.34)	-3.37919*	(-9.41)
d39	-3.9617*	(-11.93)	-3.78063*	(-13.52)
d40	-4.58969*	(-14.45)	-4.08812*	(-15.27)
d41	-4.73918*	(-14.34)	-4.29407*	(-15.42)

[a] *An asterisk denotes significance at the 1% level ; t-ratios are in parentheses*

	Specification 1		*Specification 2.*	
d42	-5.31159*	(-18.55)	-4.83185*	(-20.02)
d43	-4.46943*	(-17.2)	-4.20954*	(-19.23)
d44	-4.99299*	(-19.71)	-4.38991*	(-20.53)
d45	-4.30996*	(-16.14)	-3.50223*	(-15.52)
d46	-4.34648*	(-16.47)	-3.20811*	(-14.34)
d47	-4.19462*	(-16.74)	-3.04952*	(-14.35)
d48	-2.45549*	(-9.64)	-1.67168*	(-7.77)
d49	0.31136	(1.13)	0.49291	(2.13)
d50	3.44176*	(12.42)	2.6335*	(11.25)
d51	1.96525*	(6.87)	1.69123*	(7.02)
H_R [b]	1.1994*	(5.3)	0.7713*	(4.04)
H_S [c]	-13.4883*	(-20.04)	-9.4711*	(-16.51)
District Share	-4.9764*	(-11.87)	-4.9530*	(-14.02)
Hs x District Share	7.3131*	(10.91)	7.2781*	(12.9)
Terminal Market Price			0.2970*	(45.55)
PPI x Miles	-1.45 EE-4*	(-6.06)	-3.24 EE-4*	(-15.34)
Retail Price	0.1614*	(17.47)	0.0181	(2.16)
Total Volume	-1.63 EE-3*	(-26.47)	-1.1EE-3*	(-22.60)
Number of Observations	5122		5122	
R^2	0.83		0.88	

[a] *An asterisk denotes significance at the 1% level ; t-ratios are in parentheses*

[b] *Herfindahl-Hirschman Index computed over strawberries towards shippers at the retail level*

[c] *Herfindahl-Hirschman Index computed over shipping point regions*

Retail Sample: Terminal Market to Retail Markup (Dependent Variable is Terminal Market Price)[a]

	Retail Sample Specification V	
d43	-0.87492	(-1.86)
d44	-2.03025*	(-4.42)
d45	-2.71921*	(-5.61)
d46	-3.8323*	(-8.23)
d47	-3.85497*	(-8.48)
d48	-2.63871*	(-5.71)
d49	-0.61118	(-1.22)
d50	2.72103*	(5.41)
d51	0.92248	(1.78)
H_R [b]	1.4410*	(3.51)
H_S [c]	-13.5236*	(-11.07)
District Share	-0.08	(-0.103)
Hs x (District Share)	0.12	(0.097)
PPI x Miles	5.88 EE-4*	(13.12)
Retail Price	0.4826*	(28.77)
Total Volume	-1.47EE-3*	(-13.19)
Number of Observations	5122	
R^2	0.67	

[a] An asterisk denotes significance at the 1% level; t-ratios are in parentheses

[b] Herfindahl-Hirschman Index computed over strawberries towards shippers at the retail level

[c] Herfindahl-Hirschman Index computed over shipping point regions